STATE OF SOUTH CAROLINA

REPORT

OF THE

STATE COMMISSION OF FORESTRY

FOR THE YEAR

1929

LEWIS E. STALEY, State Forester

PRINTED UNDER THE DIRECTION OF THE
JOINT COMMITTEE ON PRINTING
GENERAL ASSEMBLY OF SOUTH CAROLINA

AN ACT to Provide for the Protection of the Forests in South Carolina: To Create and Establish a State Commission of Forestry, Etc. (Page 367, Acts 1927).

Section 1. State Commission of Forestry-Appointment-Qualifications.- Be it enacted by the General Assembly of the State of South Carolina: That there is thereby created and established a State Commission of Forestry to consist of five (5) members, each of whom shall be a resident of this State and shall be appointed by the Governor. Of this Commission two members shall be practical lumbermen, one member shall be a farmer who is a land owner, one member to be selected and appointed from the public at large, and one of whom shall be the President of Clemson Agricultural College.

Section 2. Basis of Selection-Terms-Expenses-Meetings-Secretary.- The members of said Commission shall be elected and appointed with reference to their knowledge of and interest in the forests of the State and the products derived therefrom. Of the said Commission one member shall be appointed to serve one year; one member for two years; one member for three years; one member for four years; and thereafter one member shall be appointed annually: Provided, however, That the member of the Board as represented by the President of Clemson Agricultural College shall continue a member of the Board as long as he retains his office as President of said Clemson Agricultural College. The members of said Commission shall be paid their actual expenses while in attendance upon the meetings of the Commission, or while going to and from the said meetings. The members of said Commission shall from their number select a Chairman whose duty shall be to call the Commission together as often as the public interests and need demands. The place or places of the meetings shall be designated by the Chairman, who shall likewise designate a place for the headquarters of the State Forester. The State Forester, hereinafter pfovided for, shall serve as Secretary of said Commission and shall be custodian of the books, records, and papers of said committee, which shall be kept at the headquarters designated by the Commission.

Section 3. Duties -Reports.- It shall be the duty of the Commissin provided for herein to inquire into and make an annual report to the General Assembly upon the forest conditions in South Carolina, with reference to the preservation of forests, the effect of the destruction of forests upon the general welfare of the State, and other matters pertaining to the subject of forestry and tree growth, including recommendations to the public generally as to re-forestation. Itshall take such action and afford such organized means as may be necessary to prevent, control and extinguish fires, including the enforcement of any and all laws pertaining to the protection of the forests and woodlands of the State, and may apply such parts of the forest reserve funds hereinafter provided for as may be necessary in providing methods of fire control.

It shall give such advice, assistance and co-operation as may be practical to private owners of land and to promote, so far as it may be able, a proper appreciation with the public of the advantages of forestry and the benefits to be derived from forest culture and preservation .

It shall co-operate with the Federal Government in the distribution of funds allotted to the State for forestry purposes and shall assist in the enforcement of all laws pertaining thereto, it shall have the control of the expenditure of all funds as hereinafter provided for.

Section 4. State Forester.-The Commission at its first meeting, if practicable, but in all events as soon as possible, shall appoint and employ a State Forester, who shall be a technically trained forester, with at least two years experience in technical and practical and administrative work and shall fix his compensation. The State Forester shall be charged with the duty of enforcing all provisions of this Act, and perform all such other duties as shall be directed by the Commission and shall be charged with the direction of all matters relative to forestry as authorized by the provisions of this Act, subject, however, to the supervision and control of the Commission. The said State Forester may be removed by the Commission, if he is or in the opinion of the Commission becomes for any cause unsuitable or incompetent.

Section 5. Contributions.-The State Treasurer is hereby authorized to receive contributions from any source merely for the purpose of carrying out the provisions of this Act and also to receive any funds, provided by the Federal Government for the same purpose; and all of such funds shall be disbursed by the State Treasurer upon warrants drawn by the State Commissioner of Forestry as herein created and established.

Section 6. All Acts or parts of Acts inconsistent herewith be, and the same are hereby repealed.

Section 7. This Act shall take effect immediately upon its approval by the Governor.

Approved the 26th day of April A. D. 1927.

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GOVERNOR JOHN G. RICHARDS ON REFORESTATION AND RECLAMATION

"Reforestation and reclamation were among the chief demands of the platform which I submitted to the people, and upon which I was elected.

"We have at last adopted a State policy along these lines, and much that is of importance has been done to organize that work, and render a real service to the State. This Department of our Government has great opportunities, and a most important mission to perform, in preventing forest fires, reforestation where the trees have been destroyed, and the reclamation of the State's millions of fertile acres, and especially in our coastal sections, where the rich rice fields have been almost entirely deserted, and are now lying idle.

"I urge all necessary support for this Department, that its important work may not only be continued, but that it may be properly developed, and its usefulness to the State correspondingly increased."

(Governor Richards in his message to the General Assembly in January, 1930.)

A stand of young long leaf pine trees near Aiken, S. C. protected from fire.

LETTER OF TRANSMITTAL

To Hon. John G. Richards, Governor, and to the General Assembly of South Carolina:

Sirs: Pursuant to Section 3 of the Act of Assembly creating the State Commission of Forestry, approved April 26, 1927; which provides that the Commission shall "inquire into and make annual report upon the forest conditions in South Carolina, with reference to the preservation of forests, the effect of the destruction of forests upon the general welfare of the State, and other matters pertaining to the subject of forestry and tree growth, including recommendations to the public generally as to reforestation," I have the honor to submit the report of the Commission for the year 1929.

Respectfully submitted,

STATE COMMISSION OF FORESTRY,

H. L. TILGHMAN,

Chairman.

MEMBERS OF THE STATE COMMISSION OF FORESTRY

(Appointed by the Governor)

H. L. Tilghman, Chairman, Marion, S. C. .....(1930)
B. S. Meeks, Vice-Chairman, Florence, S. C. .....(1932)
Dr. E. W. Sikes, Clemson College, S. C.—While President of Clemson College
W. H. Andrews, Andrews, S. C. .....(1931)
Paul V. Moore, Spartanburg, S. C. .....(1933)

DEPARTMENT PERSONNEL

Lewis E. Staley, Secretary to the Commission and State Forester, 105 State Office Building, Columbia, S. C.
E. I. Terry, Assistant State Forester, 4815 Wilson Boulevard, Columbia, S. C.
Mrs. Edith Gibbes Scarborough, Secretary to State Forester, 2016 Park Street, Columbia, S. C.
J. W. Trotter, Nurseryman, Camden, S. C.
C. W. Wells, Lecturer and Moving Picture Operator, Columbia, S. C.

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REPORT

WORK AND RESPONSIBILITY OF COMMISSION

The first Annual Report of the State Commission of Forestry to the General Assembly covered the calendar year 1928. No organization was begun until June 18, 1928, when a State Forester was appointed. During the rest of the year the State Forester and his Secretary constituted the paid working force of the Department. Most of the time in 1928 was spent by the State Forester in getting a bird's-eye-view of the actual forestry conditions of the State, and distributing Forestry literature and otherwise arousing public and private interest in the important timber and land use problem.

The State Commission of Forestry, through the Act of April 26, 1927, is made definitely responsible for directing the activities of the forestry work leading to the betterment of timber growing conditions in the State. There are nearly 14,000,000 acres of land in South Carolina that must grow trees if the soil is to be utilized to the best advantage. It is primarily a matter of land use. There are approximately 5,000,000 acres that will grow farm crops at a profit, which means that nearly three-fourths of the State is suited only to growing timber under present strained agricultural conditions. It is the job of the State Commission of Forestry to make this vast area produce timber, and, incidently, increase the game supply, provide an abundance of pure water for domestic purposes and water power, insure recreation and employment for the citizens of the State, prevent erosion and aid in reducing storms and floods to a minimum.

ADMINISTRATION

The South Carolina State Commission of Forestry is composed of five members, "two of which shall be practical lumbermen, one a farmer and timberland owner, one a member at large, and the President of Clemson College, who shall be a member of the Commission as long as he is President of the College." These men are chosen because of their interest in the forests of the

State and the proper development of our valuable timber resources.

The members of the Commission serve without pay, but are reimbursed for their actual expenses while performing their official duties. During 1928 the members of the Commission did not receive one cent for their time and energy in directing the work. During the present year $20.84 was used to reimburse them for a small part of their expenses. The average per member was $4.77.

THE FORESTRY SITUATION

Ninety million Americans live in frame houses and forty per cent of the industrial plants of the Nation use wood as a major raw material. From an economic standpoint wood is indispensable. The lack of forests and an ample supply of timber has caused once prosperous nations to disintegrate and cease to be a power in the social and economic progress of the world. Nature has so endowed our country with this all important product that our people in the past have made heavy inroads on the natural supply of wood with little or no thought of the future. In the early days forests were so abundant that it was necessary to destroy them for the best development of the country. The big difficulty was that we did not know when to stop this destruction and begin to regrow the forests by proper protection to the billions of acres of cut over land and for this reason our timber supply has been disappearing rapidly. Today we are cutting timber nearly six times faster than it is being grown, and at this rate we may expect our virgin timber supply to be gone within a reasonably short time. The wise use of the supply remaining and the proper and immediate reforestation of our timberlands is the key to our future prosperity.

WHAT ABOUT OUR OWN STATE?

South Carolina still has about one-half million acres of old growth timber left. Most of the vast and supposedly inexhaustible supply of timber in the State has been cut during the last seventy or eighty years, and with each successive decade the supply is being reduced rapidly. Lumbering, hunting, fishing and camping are recognized by a large number of our popu-

lation as necessary to our progress and happiness, and without the forests none of these can be maintained. This is a foregone conclusion. It is the duty of the State then to so regulate the growing and use of this natural resource that future generations may enjoy at least in part what this and former generations had. We are poor citizens if we destroy by burning, or otherwise, the things that nature has developed for our benefit and prosperity and fail to provide for the generations that are to follow. The condition of our State, the health and happiness of her citizens and her progress twenty-five years or more from now will depend largely on how we handle the present situation. Realizing this responsibility the General Assembly created the State Commission of Forestry and provided means for its gradual development.

FOURTEEN MILLION ACRES MUST GROW TIMBER

No State in the Union was more highly blessed with a wood supply than was South Carolina. Neither were there more beautiful trees of a higher quality grown anywhere. Climatic conditions are most favorable to the perpetuation of the pure pine forests and of the mixed hardwood and pine forests, as well as the pure hardwood forests that once covered the State. Of the nearly nineteen and one-half million acres originally in forests, there remains less than five hundred thousand acres of all kinds of virgin timber. There are nearly fourteen million acres that concern the Commission. Idle land makes the owner poorer. Many thousands of acres are not growing enough wood to pay the taxes when the soil is capable of producing value in timber alone at the annual rate of from two to four dollars an acre if the land is well set in trees and fires kept out.

DEPARTMENT ORGANIZATION

Forestry activities during 1929 have been extended as rapidly as funds and time would permit. The personnel of the Department now consists of a State Forester, an Assistant State Forester, a Forest Tree Nurseryman, a Lecturer and Motion Picture Operator and a Secretary to the State Forester. The headquarters of the State Forester and Assistant is Columbia, and

the Nurseryman is located at Camden, S. C. The Nurseryman was employed April 25, 1929, and in addition to operating the Nursery his duties consist of encouraging the people in Kershaw and adjoining counties in keeping fires out of the woods and reforesting their lands.

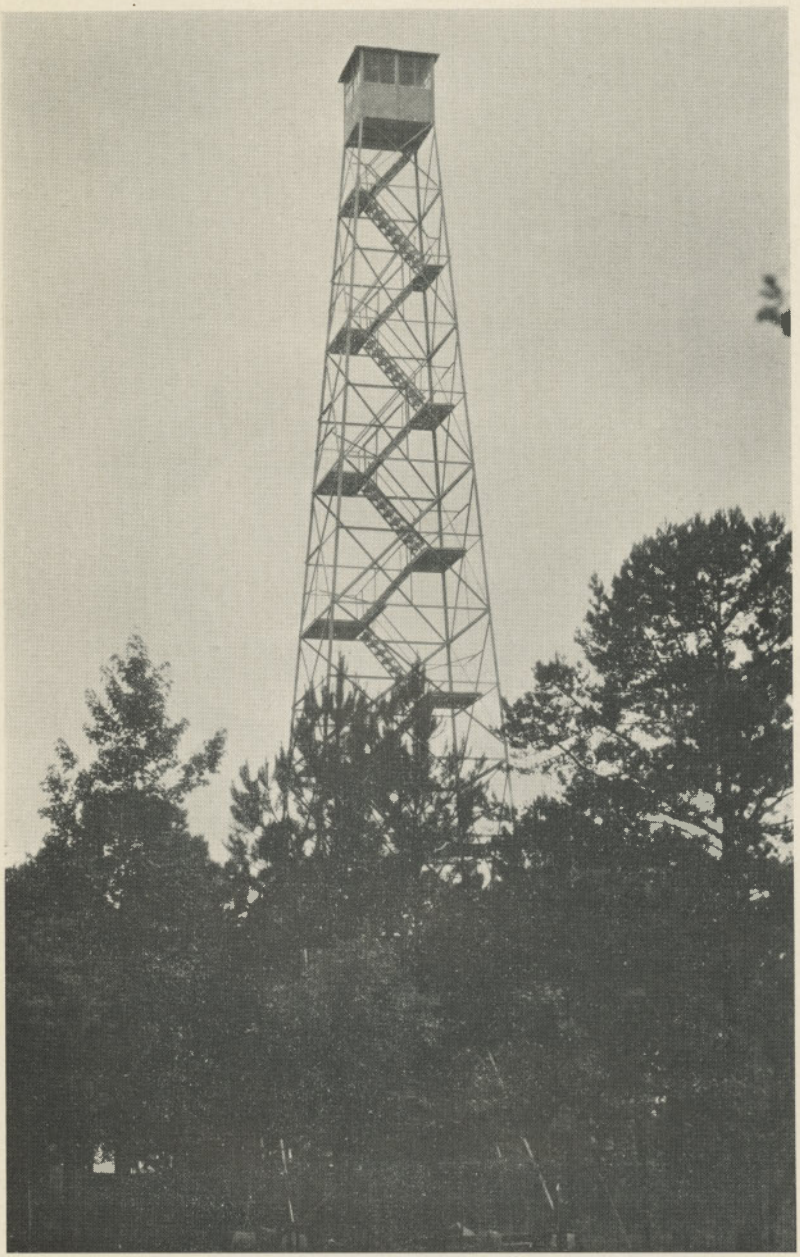
It is planned to employ two district foresters, one for the Piedmont section of the State and one for the Coastal Plain region. The district forester in charge of the Piedmont section will also have charge of the Nursery. An energetic, practical laborer capable of accomplishing results will be secured for the Nursery during the coming spring. Through this arrangement much more can be accomplished at less cost. We must grow forest tree seedlings at a cost not to exceed $3.00 per thousand so that land owners may establish plantations at the least possible expense.

On June 15, 1929, Dr. E. A. Zeigler, a forester of the highest type with broad experience, was appointed Assistant State Forester. Within a few weeks, however, he was offered a position with the United States Forest Service at nearly double the salary the Commission could pay. He left the service on July 3, 1929.

On August 22, 1929, Mr. E. I. Terry, the present Assistant State Forester, was employed. Mr. Terry has spent practically all of his time on a publication designed for public school use in the State. It is hoped to have this publication ready for distribution at the beginning of the next school year. All of the field work during 1929 had to be done by the State Forester and the Nurseryman in charge of the Camden Nursery.

FOREST FIRE PROTECTION

Section 3 of the Act of April 26, 1927, provides that it shall be the duty of the Commission—TO INQUIRE INTO AND MAKE AN ANNUAL REPORT TO THE GENERAL ASSEMBLY UPON THE FOREST CONDITIONS IN SOUTH CAROLINA, WITH REFERENCE TO THE PRESERVATION OF FORESTS, THE EFFECT OF THE DESTRUCTION OF FORESTS UPON THE GENERAL WELLFARE OF THE STATE, AND OTHER MATTERS PERTAINING TO THE SUBJECT OF FORESTRY AND TREE GROWTH, INCLUDING RECOMMENDATIONS



First State forest fire observation tower erected in Charleston County near Middleton Gardens.

TO THE PUBLIC GENERALLY AS TO REFORESTATION. IT SHALL TAKE SUCH ACTION AND AFFORD SUCH ORGANIZED MEANS AS MAY BE NECESSARY TO PREVENT, CONTROL AND EXTINGUISH FIRES, INCLUDING THE ENFORCEMENT OF ANY AND ALL LAWS PERTAINING TO THE PROTECTION OF THE FORESTS AND WOODLANDS OF THE STATE.

It is fully realized that the Commission's knowledge of the forest fire situation in the State and funds at its disposal are quite inadequate for intelligent and effective administration. We have had no field force to secure data on the area burned over annually and the damage entailed. From reports by County Agents and others throughout the State it is conservatively estimated that more than three million acres burned over during 1929, which was a rather unfavorable year for forest fires. Perhaps the total area was more nearly five million acres if the facts were obtainable. A material reduction in the area burned every year is by far the greatest problem that the Commission has to contend with. We need, and are gradually getting organized effort between individual landowners, the county, State and Federal governments with the responsibility for fire prevention and suppression first in the land owner, second in the State and third in the National government.

ORGANIZED EFFORT

There are now five forest fire protection organizations cooperating with the State, covering a total of 277,830 acres. On this area adequate and intensified forest fire protection plans are being made up and put into effect. Plans for protecting these areas are cooperatively worked out by the owner of the land and Department officials. The owners keep a careful and detailed record of the cost of building roads and telephone lines, burning rights-of-way, constructing towers, and other expenses necessary in carrying out the plans. Reimbursement by the Commission is made on the basis of twenty-five per cent (25%) of the cost of protecting the areas from fire. This plan was adopted in order to get the work started. It is hoped that the present cooperators will soon become a part of a larger unit organized to include all of the timberland owners either in a

county, or other political or geographical units that will economically and adequately handle the fire problem. Each unit should be composed of not less than one hundred thousand acres of timberland and in many cases the county might be the organized unit. At least one forest fire detection tower should be erected in each county with telephone connections to forest fire wardens, who will take care of all protection work in that unit. Then with an organized fire fighting force ready to put fires out immediately when they occur, we can hope to accomplish results. Short of such an organization forest fires will continue to lay waste our valuable timberlands.

During 1929 the five cooperators expended a total of $19,867.01 in protecting their property. Several new forest fire protection organizations are well underway and it is hoped that something definite can be accomplished early next year. During the year the Commission gave advice and assistance to other land owners aggregating more than a million acres of timberland. A number of plans for forest fire protection work were made up and suggestions offered for their effectiveness. At least one-half million additional acres have a crude form of forest fire protection. The landowners want to keep fires out of their woods, and while they are not spending very much money for the purpose, they are insisting that their tenants and others with whom they come in contact prevent and extinguish forest fires. Private protection is increasing at a reasonable rate, largely due to the results obtained by the agencies with which the Department is cooperating. The area protected serves as a demonstration to adjoining landowners, and the idea of growing timber is reaching far beyond those that are actually in the work. A much deeper interest is manifested by hundreds of timberland owners than was noticeable last year. They are beginning to realize that protection from fire is the basis for growing timber. Through talks to organizations such as Kiwanis Clubs, Rotary Clubs, State Federations of Women's Clubs and their local units, and other organizations, favorable public sentiment continues to grow, and the request for information on forestry and the proper methods of handling timberland has increased beyond expectation.

Moving picture outfit that will carry the story of forest fire protection to every school in the State.

EDUCATIONAL MOTION PICTURES

An educational moving picture outfit is now telling the story of the condition of our forests and what is necessary to remedy it, to the boys and girls of South Carolina. The moving pictures will be shown in every school house in the State, particularly in the wooded sections, and a number of moving picture reels are provided for city schools as well, to the end that this generation of boys and girls may bring about reforestation in a sane and practical way, the very thing that our forefathers ought to have looked forward to and worked for.

FOREST FIRES MUST NOT BE SET

"Fine, imprisonment and payment of damages for wilfully, maliciously, or negligently firing woods."

"Whoever shall wilfully, maliciously or negligently set fire to or burn grass, brush or other combustible matter, so as thereby any woods, fields, fences or marshes of any other person or persons be set on fire, or cause the same to be done, or to be thereunto aiding or assisting, shall, upon conviction thereof, be punished by a fine of not less than twenty-five nor more than five hundred dollars or imprisonment of not more than one year in county jail, and shall, moreover, be liable to the action of any person or persons who may have sustained damages thereby: *Provided*, that no person or persons shall be prevented from firing woods, fields, lands or marshes within his own bounds, so that he suffer not the fire to get without the bounds of his lands and injure the woods, fences or grass of his neighbor or neighbors."

Thousands of copies of this law were printed on 6-ply tough jute cardboard and distributed to timberland owners in all parts of the State for posting in public places. If funds were available to distribute this poster to every timberland owner in the State for use on his lands a lot of good would come from it.

FORESTS PREVENT EROSION

One county alone in the State contains ninety thousand acres so badly eroded that it will never be farmed again. Forests are natures best water and soil holders. A forest cover does not entirely eliminate the possibility of serious damage by floods,

but it has been unquestionably proved that a well timbered area will conserve excess water to a much larger degree than where no forests exist. The thick mat of leaves and litter on the ground is able to absorb many hundred times its own weight of water so that the rain that falls suddenly is quickly soaked up and eventually comes to the surface in the form of springs and continuous flowing streams. In this way trees help control the quick rush of flood waters that destroy farms, inundate towns and take human lives.

While it is true that a forested area is limited in the amount of water it can absorb, it is usually sufficient to check the disastrous floods that cause so much unnecessary damage. Not only does the forest floor conserve water, but the tree roots help materially to hold the soil in place instead of letting it be washed away, and by saving the soil forests help tremendously in taming the floods, for after all it is not the water that does the most damage, but it is the millions of tons of earth, stone and debris of all kinds that is carried with it. If we could just prevent floods from carrying earth along we could decrease the flood's power to do harm.

The loss of earth not only creates a great waste to the farms and roads from which it is washed, but it fills up the stream beds and causes the water to overflow areas and deposit debris far from where it was first picked up. Conservation of moisture has been the concern of economists over a long period of years. The conclusion has been reached that a well timbered area provides the answer. Water goes into the soil and during the dry period is given off through the trees and thus helps to reduce drought damage. The flow of springs and streams is also maintained, and, in general, water is conserved until most needed by individuals and crops. In these ways trees are doing more than their share in preventing floods and equalizing the distribution of rain fall.

PREVENT ANNUAL LIGHT BURNING

Woods fires are a curse to any state, and even the light annual burning practice in South Carolina must be severely condemned. While light burning may not kill the larger trees, unquestionably the basis for the future forests—the baby trees—are practically all destroyed. This is an indisputable fact. Again it

is said that light burning does not effect the growth of trees that are not killed, but experiments over a number of years by the Southern Forest Experiment Station very clearly indicate that this statement is quite erroneous.

Light burning must be looked upon with disfavor because in thousands of instances while termed "controlled" burning it is the most serious kind of "uncontrolled" burning. Fires are started and continue on their mission of destruction until Providence interferes, whether on land owned by the person setting the fire or on lands of his neighbor. Every timberland owner has a perfect right to burn up his own timber if he desires to do so, but when fires are permitted to "run wild" and cause damage to the land of another, drastic action must be resorted to if South Carolina is to hold her rightful place in the economic and industrial world. While the present South Carolina forest fire law is inadequate for the best development of her forestry interests, a lot of good can be accomplished through its rigid enforcement. The State Commission of Forestry and the State Forester invite and urge the fullest cooperation in carrying out its provisions.

FORESTRY EXHIBITS

During the year the Department set up exhibits at seven fairs as follows:

State Fair, Columbia, S. C.
Colleton County Fair, Walterboro, S. C.
Pee Dee Fair, Florence, S. C.
Fairfield County Fair, Winnsboro, S. C.
Chester County Fair, Chester, S. C.
Sumter County Fair, Sumter, S. C.
Orangeburg County Fair, Orangeburg, S. C.

The exhibit at the State Fair covered a space of 20 by 66 feet. The space at the other fairs was much less. In each case the exhibit was divided into four sections. Each section was planned to cover in a general way the subjects of forest fire protection, tree planting, tree growth and timber utilization.

The fire protection section showed a burned area of loblolly pine on one side of the road and an unburned area on the opposite side. There was just one more season's growth on the

unburned trees, but the difference in diameter and height growth was almost unbelievable. The trees that were not burned averaged 2½ feet taller and 1 inch thicker than those that were burned. The second section illustrated the growing of trees in the Nursery from seed and planting them on waste lands. The third section was intended to show road-side beautification and the fourth section covered timber utilization, including the turpentine industry, using the United States Forest Service booth, "Fire Kills Trees and Robs Soil," as a background. This year it is planned to exhibit at nearly every fair in the State.

STATE FOREST TREE NURSERY ESTABLISHED

To many individuals the growing of forest trees to be planted on idle lands in the State may seem wholly unreasonable and unnecessary. Familiarity with actual conditions soon changes this idea. Millions of acres of land, only capable of producing trees, are so badly burned and the timber growth so completely destroyed, with no seed trees left for reforestation, that planting is necessary if trees are to be grown on these areas within a reasonable time. Of course, nature will eventually restock these barren areas, but many timberland owners prefer getting a stock of trees started now, rather than to wait three or four years, and perhaps fifteen to twenty years, on natural restocking. Natural regeneration is very often unsatisfactory and too slow. Taxes must be paid on the land and no timber is being grown to offset this cost. Every year that an acre is well set with trees it increases in value from $2.00 to $4.00.

The Camden Chamber of Commerce is largely responsible for our forest tree nursery being located near Camden. It is an ideal site, located about one mile from Camden near the Wateree Toll Bridge, on National Highway No. 1. The Chamber of Commerce rented the land and donated it to the Department for the first month, but after funds were found to be available the Commission decided to purchase an area totaling five and one-half acres and use it exclusively for the growing of forest trees for planting "loafing" areas in the State and for the beautification of the State's excellent highways. For this planting season very few trees were available from the Nursery. At the time the appropriation became available for starting the nursery all tree seed dealers had disposed of their supply of

State Forest Tree Nursery where trees are grown and sold to timberland owners at cost.

tree seeds, but a small quantity were finally secured through courtesy of other State Departments of Forestry with established nurseries. At present the nursery contains the following trees:

200,000 Shortleaf Pine (Pinus echinata)
498,000 Loblolly Pine (Pinus taeda)
400 Longleaf Pine (Pinus palustris)
33,000 Slash Pine (Pinus caribaea)

Some of the trees will be planted during the coming spring, but many of them are too small and will necessarily be held until next year's planting season. The demand for trees for the spring of 1930 was far beyond what the Department could supply. It was necessary to secure more than four hundred thousand trees from other states for the work in South Carolina. More than one-half million trees were planted during 1929.

Planting forest trees has been increasing in the United States by leaps and bounds, and we have reason to believe that South Carolina will follow the example of other states. There is no other quick way of producing value on millions of acres in this State except through planting. Plans have been made for having available at least one and one-half million trees next year. What trees are available for sale this year to timberland owners in the State will be sold at $3.00 per thousand, and the cost of packing and transportation. Several Commercial nurseries are asking two and three times this amount for the same trees.

WATER SYSTEM INSTALLED AT NURSERY

For successful nursery operations an adequate supply of water must be available at all times. To this end a pump house 12x16, was constructed and a six horse power gasoline engine and suitable water pump were installed a short distance from the nursery along a small stream. This outfit pumps the water to the nursery through a two inch pipe for direct watering purposes. During next year this system must be extended to cover at least three acres of the nursery. For the present one-half acre is piped and available for use. A direct "Skinner" water system will be installed during the next year.

COURT CASE OF ILLEGAL WOODS BURNING

The first case for illegally burning the woods was begun early in May. At the request of the State Forester and in accordance with a cooperative forest fire protection agreement between the Cooper River Timber Company and the Commission, definite statements to the effect that certain fires were set to "green up the wood" were made by persons employed by the Cooper River Timber Company against W. S. Weeks, Charles Martin and T. C. Cadden. The following statement was made in support of our contention that these gentlemen set fire to the woods without the necessary protection:

STATE OF SOUTH CAROLINA,
COUNTY OF CHARLESTON.

"PERSONALLY appeared before me Mr. H. B. Beach, who, being duly sworn, says, on oath, that he is of Ravenel, South Carolina; that he is employed by the COOPER RIVER TIMBER COMPANY in the capacity of care-taker; that on Monday, April 8, 1929, Deponent set out to show Mr. T. W. Bivens a boundary line between the COOPER RIVER TIMBER COMPANY property and the property of the BRADLEYS, in order to set a fire-line; that he thereupon discovered a fire burning on the land of the COOPER RIVER TIMBER COMPANY which fire had evidently been burning for some time and which had destroyed thousands of young trees, causing considerable loss to the Company. That Deponent had information leading him to believe that the fire had been started by one W. S. WEEKS, one CHARLES MARTIN and one L. C. CADDEN, and that thereupon, in company with Mr. T. W. BIVENS and WILLIAM BIVENS, Deponent interviewed CHARLES MARTIN. That the said CHARLES MARTIN admitted to Deponent, in the presence of the said MESSRS. T. W. BIVENS and WILLIAM BIVENS, that he CHARLES MARTIN, along with W. S. WEEKS and L. C. CADDEN had started the fire on BRADLEY'S property and that it was this fire that had gotten across the road and into the land of the COOPER RIVER TIMBER COMPANY.

That the said CHARLES MARTIN told Deponent that before starting the fire, he had raked the said road, the said road

being about a mile long, but investigation by Deponent disclosed the fact that only about fifty or sixty feet of the road had been raked and at the point at which the fire had been started and other points on the road showed no evidence of having been raked, and that the fire had spread across the road at several points at which it had not been raked.

H. B. BEACH.

SWORN to before me this 12th day of June, A. D., 1929.
FREDERICK W. ALEY (L. S.)

Notary Public of South Carolina.

PERSONALLY appeared before me MESSRS. T. W. BIVENS and WILLIAM BIVENS, who being duly sworn, state that they were present with the above named Deponent at the time the above took place, and that the facts stated in the above affidavit are true and correct of their own knowledge."

WILLIAM BIVENS,
T. W. BIVENS.

On November 18, the case went before the Court in Charleston with the result that the Grand Jury returned a "No Bill." The law against burning the timberlands of another is somewhat inadequate but quite satisfactory in the above case. Forest Fire Laws cannot be enforced until the public realizes the serious damage forest fires cause and become interested in keeping fire out of the woods. Public sentiment against burning the woods is gradually changing.

FINANCIAL STATEMENT

Receipts

Balance as of December 31, 1928	$ 377.52	
State Appropriation	12,500.00	
From U. S. Department of Agriculture under Section 2 of the Clarke-McNary Law for period Oct. 1 to December 31, 1928	4,010.30	
From U. S. Department of Agriculture under Section 2 of the Clarke-McNary Law for period Jan. 1 to March 31, 1929	3,565.24	
From U. S. Department of Agriculture under Section 2 of the Clarke-McNary Law for period April 1 to June 30, 1929	3,419.09	
Selling 45,500 longleaf pine seedlings from Camp Jackson Nursery @ $4.00 per thousand	182.00	
From U. S. Department of Agriculture under Section 4 of the Clarke-McNary Law for period ending June 30, 1929	1,692.16	
From U. S. Department of Agriculture under Section 4 of the Clarke-McNary Law for period ending September 30, 1929	357.68	
Miscellaneous receipts (fire posters)	7.00	$26,114.99

Expenditures

Salaries	$ 8,055.33	
Wages	714.34	
Special Payments	30.70	
Freight, Express and Deliveries	104.39	
Travel	878.71	
Telegraph and Telephone	211.40	
Repairs	220.84	
Printing and Advertising	200.06	
Other Contractual Services	10.00	
Office Supplies	298.96	
Educational Supplies	289.20	
Motor Vehicle Supplies	743.31	
Agricultural Supplies (Nursery)	976.86	
Other Supplies	70.95	
Office Equipment	176.35	
Motor Vehicle Equipment	1,991.14	
Nursery Equipment	2,173.38	
Educational Equipment	895.10	
Reimbursement to Timberland Owners	4,280.25	22,321.27
Balance (mostly under contract)		$ 3,793.72

THE FARM WOODS

Farm woods in South Carolina is any body of timber which is held as part of a farm. It may be large or small. It may be virgin timber or second growth. It may be a well stocked, thrifty stand or it may be a poorly stocked, scattering stand of trees of all ages and conditions. The relation to the farm as a unit and to farm practice is of primary importance. But the same general principles govern its management as apply to any other timber tract. When the farm woodland is wholly or in part made up of old, mature trees, the owner should make the most out of them as early as possible. Naturally his own needs will be considered first. If the land is to be eventually cleared no thought of reproduction of the area is necessary. If, however, the area is to become permanent woods the owner should plan for the reproduction of valuable tree species. To do this one or two seed trees to the acre are necessary. Without seed trees the landowner is taking a big chance on a sufficient amount of reproduction within a reasonable time. Nearly forty per cent of the timberland in the State is an inseparable part of the successful operation of our farms. Farm timber has kept thousands of farmers from bankruptcy during the last decade and will continue to do so if adequately protected from fire.

LOGGING WALNUT TREES

Most of the walnut timber in the State is located in the farm woods. An important and necessary part of the economical use of this wood is the cutting of the proper trees and the correct method of working them up and transporting them to the mill. Improper logging through ignorance or carelessness materially reduces the value of the product and return from it.

WHAT TREES SHOULD NOT BE CUT

(1) ALL TREES WITH FENCING OR IRON IN THEM: Such logs are dangerous in the mill. And, if they do get by the inspector, may make a widow and orphans.

(2) SMALL TREES: Unless a tree will make at least one log 12 inches in diameter at the small end and 10 feet long it is not of merchantable size.

(3) DEFECTIVE TREES: No tree that will make only cull logs should be cut.

(4) HOLLOW BODIED TREES: A hollow log should have at least 6 inches of sound wood to be worth anything at all.

FELLING THE TREE

Many trees which contain good logs are practically ruined by improper felling. Where a tree forks in every instance it should be cut so that the fork will hit flat on the ground, otherwise the weight of the upper prong will almost invariably split and destroy the value of the logs. It is a very common practice to fell trees of moderate size by sawing in from one side of the heart and then starting the saw from the other side of the tree and wedge it over. This is commonly called "match saw" and probably destroys more good lumber than any other one mistake in cutting trees. The strain on the inner fiber of the tree as it falls over, almost invariably causes splinters to be pulled out or causes the tree to split. Where there is a small splinter pulled in the butt of the tree, although it may not look serious, traces will appear several feet up the tree.

Wherever surroundings will permit, trees should be under-sawed. That is, the saw should be started from the side toward which the tree leans and the tree should be practically sawed off from this one direction. When only about an inch of sap wood is holding on the back side of the tree the saw can be taken out and a few strokes of the axe will permit the tree to fall. Where under-sawing is not practical the tree should be notched with the axe deep enough to prevent splitting when it is sawed off from the opposite side.

LOGGING THE TREE

In most kinds of timber the log lengths are 12, 14 and 16 feet. Therefore consumers expect lumber of these lengths. The rules for first and second walnut lumber are more lenient but require 45%, 10 feet and longer. Butt logs should be cut 10 to 16 feet long wherever possible.

In culling logs there are a few general rules that always apply: (1) Make the butt log as long as possible. (2) Make the lot yield as many clean logs as possible. (3) Cut at the crooks so

both logs may be straight. (4) Cut off big hollow butts. (5) Do not leave log ends exposed which results in splitting and cross-cracking. If possible leave the ends together several days after cutting. (6) When piling the logs for inspection, it should be borne in mind that unless the logs are so piled that the mill inspector can see the entire length, he will assume that many defects are concealed. To secure the grade to which the logs are entitled they should be piled so that if necessary they can be rolled over and the proper grade for each log determined.

DEFECTS IN WALNUT LOGS

Wind shake, unless confined to a very small area around the heart, renders the log absolutely worthless.

Ants work into the heart of the trees and frequently the interior of the log will be honeycombed and worthless. Worms are often not very apparent but are a dangerous defect.

Crook is a very serious defect. As the lumber must be edged straight this involves a serious waste depending on the amount of the crook.

Splinter pull always extends considerably farther into the log than outside evidence indicates and greatly reduces the value of the best part of the tree.

Lightning cracks, even when healed over, decay and worms have usually gained headway in the logs.

Splits and end-checks are mostly accidents of felling. They may easily make a prime log worthless. End-checking is most serious in the spring and early summer.

Keep the log out of the sun as much as possible and delay bucking the log until several days after tree is felled.

Sap wood is very undesirable and more than average sap is a serious defect.

WALNUT STUMPS

A great many stumps are dug out each year that are worthless and must be thrown away. Do not dig out poor stumps. A good stump is 20 inches or more in diameter, 30 inches above the ground. It should be bell-shaped and show a minimum of 12 inches of figure when cut into boards.

A walnut buyer usually will not purchase a few trees. It is more profitable when each farmer has a few trees only, to

pool their supply and make up a carload, which is about the only way the walnut buyers will make purchases.

PRIVATE NURSERIES

Already a number of small garden-bed nurseries have been established for individual planting use and this work should be continued where the owner has sufficient knowledge of nursery practice to grow trees successfully. The growing of forest tree seedlings and transplants is very exacting. It requires great care in preparing the nursery beds, planting the seed, caring for the seedlings and lifting the trees. Just a few hours of neglect at certain periods during very dry weather or extremely wet weather will mean heavy losses in seedlings. For this reason persons desiring to grow forest tree seedlings and transplants should fully equip themselves with the details of operation before undertaking the work.

KINDS OF TREES TO PLANT

Care should be exercised in selecting the kind of pines and hardwoods for reforestation purposes. Pines and hardwoods having points of merit for adaption to our soil and climatic conditions are: Longleaf, slash, loblolly (old-field), and shortleaf yellow pine of the hills and uplands. The longleaf and slash pines are the most valuable because they yield large quantities of turpentine in addition to timber. Slash pine grows much faster than longleaf and the loblolly pine grows faster than shortleaf pine. White ash, yellow poplar or tulip tree, black walnut and white oak are among the best hardwoods.

SOWING OR PLANTING PINES

Land may be reforested to pines by sowing the seed directly or by setting out the small trees, usually after one year's growth in the nursery bed. Direct seed sowing is not recommended. It is also practicable to secure little pines from the woods where this is possible. These pines usually have a much less desirable root system than do those grown from seed in nursery beds. Very often large numbers of seedlings are easily and cheaply obtained from old fields, pits and fills along the roadway. This type of stock, however, is somewhat unsatisfactory because of

its poor root development and more or less stunted condition. Field or open-grown seedlings only should be used when it is possible to secure them. Nursery-grown pines are always more satisfactory if available, and are recommended for planting even though a little more expensive. If pine seed can be collected or bought at a fair price, direct sowing may give good results. At least four times as many seed are required per acre for direct seeding as where nursery grown seedlings are used.

SOIL PREPARATION AND BED MAKING

The successful growing of pine trees requires light, sandy loam soil. Heavy clay soils must be avoided. To produce stocky trees requires the best possible soil conditions, both as to texture and fertility. The best results will be obtained after the soil lies fallow during the summer before the trees are to be planted. Field peas or soy beans should be planted and plowed under just prior to blossoming. This operation should be repeated as often during the year as is possible to get the soil in a much more satisfactory condition for sowing the seed. Too much care cannot be exercised in preparing the seed bed.

COLLECTING FOREST TREE SEED

Pine seeds are most economically obtained from logging operations. The cones or burrs may be picked from standing timber, but this is slow, expensive and quite an impractical method on a large scale. The seed ripens in the early fall and the cones must be gathered before they dry out and open. The cones should be spread on a tight floor in a well aired building or on canvas or tight burlap in the sunshine. After they dry out and begin to open the seed may be shaken out by beating or roughly moving the cones over the floor. Each seed contains a wing to assist nature in its distribution, and this wing may be removed by rubbing the seed over a wire screen with a mesh large enough for the seed to fall through. After the seed are secured they should be stored in air-tight jars and kept in a cool place until ready to plant.

The cost of collecting the seed varies with conditions. Under favorable circumstances on logging operations $2.00 per pound for loblolly or slash pine, $4.00 per pound for true shortleaf

pine, and $1.00 per pound for longleaf pine is a fair cost. Where large quantities are collected these costs can be somewhat reduced.

WHEN SEED SHOULD BE SOWN

The best results in South Carolina have followed sowing slash and longleaf pine seed in the fall. If sown early, say by November 1, they will usually germinate in ten days. Sowing made in late November has given good results, with germination occurring in early spring. Loblolly and hill shortleaf pines require a longer time and do not germinate that same fall. If the beds are not well protected with wire screen spring sowing is more satisfactory.

DIRECT FIELD SOWING

Good results have followed from sowing slash pine seed on wet, savanna, or crawfish lands in the coastal plain. It has been sown broadcast in grass, using two pounds per acre, and also sown by the "seed spot" method of scattering about fifteen seeds at intervals of about 5½ feet apart in or on furrows spaced 8 feet apart (about 1,000 spots per acre). Broadcasting will require about two pounds per acre of slash or loblolly pine seed, and the seed-spot method one pound per acre. After dropping, the seed should be stirred into the soil with a rake and stepped on to firm the soil. The broadcast method might be used for slash pine and loblolly pine in lowlands, and the seed-spot way in the drier places. The seed-spot method is also recommended for sowing either shortleaf (hill shortleaf) or longleaf pines. Pine seeds are so palatable to birds and rodents that they should be coated with red lead powder after first moistening the seed with water. In large-scale operations in Southeast Louisiana, the seed-spot method has given good results with loblolly and slash pines. It is, however, being replaced by the method of planting nursery-grown trees.

COST OF DIRECT SEEDING

The cost of reforesting land by direct sowing or by planting trees depends upon several variable factors. Using one pound of loblolly or slash pine seed for seed-spotting an acre and count-

ing on one day's labor for sowing would cost $6.00 at the following assumed prices: Seed $3.00, furrowing 50 cents, labor $2.50. If an acre is broadcasted with two pounds of seed, the cost will be approximately the same since the labor of sowing is a small item. For the true or hill shortleaf pine, the cost would be reduced by about one-sixth the above (seed at $4.00 a pound and using one-half the amount); and for longleaf pine increased about one-sixth (seed at $2.00 a pound and using twice as much as shown above). Large scale operations should come much below these costs.

SOWING SEED IN NURSERY BEDS

A seed bed 4 feet by 12 feet is suggested. A frame is made of 1-inch by 4-inch up to 1-inch by 12-inch boards set about two inches in the ground, and some soil scraped around the outside. The soil inside the frame should be pulverized and a top layer of woods dirt or fine stream silt or soil added. This is to provide acid soil and as free as possible from weed seeds. A serious "damping off" fungus is apt to prevail in alkaline or neutral soils. The seed is sown evenly on a 4-feet by 12-feet bed using one-half pound of slash pine seed (about 9,000), or of loblolly seed about (10,000) one-fourth pound of hill or true shortleaf (about 12,000) or one and one-half pounds of longleaf seed (about 12,000). A very thin layer of the same acid soil is then sprinkled over the seed and the surface firmed with roller or shovel. As much as one-fourth inch of stiff clay soil is liable to prevent germination. Cover very lightly and then keep the soil moist during the period of germination. A burlap spread over the surface aids in keeping the soil moist, but it is absolutely essential to remove it as soon as germination begins. Otherwise the seedlings cannot grow upward and soon die. With average success there should be from 2,500 to 5,000 seedlings to the bed. Generally, about one-half of the pine seeds germinate and grow successfully.

BEDS MUST BE SHADED

Shades are erected immediately after the covering is removed from the bed to protect the trees from extreme heat and prevent rapid evaporation. The most convenient shades are made of

strips one-half inch thick, two inches wide and four feet long nailed to two, either four or eight feet long strips one inch by two inches. The distance between the cross-strips should be the same as the strip is wide. The shades are designated to admit not more than fifty per cent direct sunlight, which is ample for the proper growth of the seedlings. A no shade experiment was conducted for loblolly pine at the State Nursery with the result that less than one-fourth the number of trees were grown on the unshaded beds. The seeds were planted in June which may account wholly or in part for the failure. The same experiment will be conducted next year for earlier planting.

KEEP SEED BEDS FREE FROM WEEDS

Seed beds should be kept practically free of weeds. In removing the weeds great care must be exercised so as not to uproot or loosen the small, tender trees. In three or four days of warm wet weather weeds will be sufficiently large to handicap the proper growth of the trees. Plenty of moisture applied late in the afternoon (preferably after sundown) is necessary to the successful growth of the seedlings.

WHEN SHOULD TREES BE PLANTED?

In South Carolina as a rule seedlings should be set in their permanent location during the winter, or early spring after the first year's growth, and before the buds begin to swell or growth starts. In the lower coastal plain, planting has been successfully done during the dormant period between the time when fall rains set in and the spring growth begins. Where the ground freezes during the winter planting should begin as soon as holes can be dug and planting satisfactorily done.

A good method for planting all species of pine, except longleaf, is to run furrows eight feet apart to break the soil and mark off the tract. The trees are then set in the furrows about five and one-half feet apart, requiring about 1,000 trees per acre. The more fully the ground is broken up in advance, the more early growth will be stimulated. The expense should be kept as low as practicable. On washed hillsides a spacing of six feet by six feet (1,210 trees per acre) is advisable. This will cost a little more at the start but permits thinning out later on so as to leave the trees about 100 to 150 per acre for the final

crop. The loblolly and true shortleaf pine should be spaced not to exceed six feet each way. Before planting, long taproots should be pruned back to about eight inches. This results in the tree planting easier and stimulates root development. *Do not plant longleaf pine seedlings in furrows.* The shifting sand very often covers the terminal bud and when this is done the tree will die. Longleaf pine should be planted either on level spaces or, preferably, on the higher ground of a furrow. Watering and weeding are not practicable for either seed or seedlings sown or planted out in the field or woods.

ESSENTIALS OF GOOD PLANTING

The seedlings should be lifted carefully from the seed bed or field so as not to break the fine rootlets. They may be tied in bundles of 50 to 100 and packed in wet moss or burlap, or placed in tubs or buckets containing a thin mixture of fine soil and water. If not planted the same day, "heel" them in the ground, *always in a cool shaded place, and keep the soil moist.* The roots and stems should be covered with fresh soil but the top left open. Trees received by shipment, if not planted at once, should always be "heeled" in immediately upon receipt.

The trees for planting are carried around in buckets. During planting the roots must at all times be kept wet. The least drying coagulates the thick sap and the trees cannot recover. The mattock or grubbing hoe is the best tool for digging holes, which should be just a little larger than is needed to spread the roots. The seedlings should be planted a little deeper than they grew in the nursery, with the roots spread out and not bunched. After setting the trees the soil is filled in about the roots and firmed, and loose material left over the top to act as mulch. Holes are often dug too large and the trees set too loosely in the ground. In open soil, a wedge-shaped tool or dibble has been used most successfully. Advantage should be taken of favorable weather conditions. Cloudy weather following rain affords ideal conditions. After planting, no further attention is necessary except to see that the trees are protected from fire, and from hogs and other stock for at least the first three years.

COST OF PLANTING SMALL TREES

Assuming that about 1,000 trees are set to the acre (about 5½ feet by 8 feet) at a cost of $2.00 for growing, 1½ days labor for planting at $2.50, and furrowing at 50 cents, the total cost per acre amounts to about $6.25. These figures are merely indicative of the possible cost, according to the best information available. One lumber company in Louisiana using home-grown trees reports planting 1,000 acres at a cost of $4.00 per acre for all items. During next year accurate costs of planting will be secured from plantations in all parts of the State.

HOW FAST DO TREES GROW?

The rate of growth of trees in South Carolina depends on many variable factors. Be sure to select trees that are well adapted to the soil in which they are to grow. A good general rule is to grow the same species of trees as the area produced originally, although a change in environment such as no forest fires as against the so called "light burning" may change the adaptability of certain tree species to certain localities. Many longleaf pine trees will continue to grow after fire has destroyed most of the loblolly pine trees, while some trees thrive best on lowlands with plenty of moisture and others will soon become stunted and die under the same conditions. The entire area of this State is well adapted to tree growth and parts of the coastal plain equal, if not excel many other localities in timber growing possibilities. This is clearly shown by the following results of a study of "shortleaf" pine (Pinus taeda) by Cornell University Foresters under the direction of A. B. Recknagel, Professor of Forest Management and Utilization, on lands of the North State Lumber Company, in Berkeley County.

Professor Recknagel says:

Through the great courtesy of Mr. G. J. Cherry, President of the North State Lumber Company, sixteen Cornell Seniors from the University's Department of Forestry and myself spent the first week of April, 1928, in camp at Witherbee, S. C., on the holdings of the Company forty-five miles up the Cooper River from Charleston. Tents and other equipment and the services of an expert camp cook were put at our disposal by Colonel Bugbee, Commandant at Fort Moultrie. Perfect weather favored the

enterprise and the northern visitors had the unique experience of summer in April.

The time was spent in observation of the logging operations of the North State Lumber Company and of the nearby (but over, oh, such roads!), Tuxbury Lumber Company in timber estimating and in the study of growth of pine, including the establishment of permanent sample plots for repeated measurements. It is this last phase of our work which will probably be of greatest interest. The South Carolina coastal plain is held by competent authority to be the fastest growing pine land in the United States—our studies tend to confirm this.

By a lucky chance, four quarter-acre permanent plots, established by the Federal Forest Service, were re-measured just in advance of the logging. These are the results—condensing the four plots into a single area:

TABLE 1

Trees on an acre of thirty year old "Shortleaf" pine ("marked" means designated for cutting under the Company's rule of cutting only trees over 14 inches in diameter at 14 inch stump.)

Diameter Breast High	Marked	Unmarked	Total
7	..	9	9
8	..	21	21
9	..	32	32
10	2	22	24
11	1	25	26
12	13	9	22
13	17	6	23
14	17	..	17
15	8	..	8
16	7	..	7
17	1	..	1
18	2	..	2
Total trees	68	124	192
Total Col. (Cu. Ft.)	2,605	2,057	4,762
Per Cent	55%	45%	100%

This table is particularly significant in that it shows the conservation policy of the North State Lumber Company in logging over its second growth pine land. To leave twice as many trees as are cut, is not only good forestry but good business judgment.

Consider what this area has produced in 30 years; 4,762 cubic feet, or at 90 cubic feet per cord, nearly 53 cords, about 1 4/5 cords per acre per annum. This growth challenges comparison.

Applying the annual growth per cent to unmarked trees, the future yield may be forecast as follows:

TABLE 2

Forecast of Yield in Cubic Feet Per Acre Second Growth "Shortleaf" Pine, Thirty Years Old

Diameter Breast High Inches	Unmarked Trees Cubic Ft.	Yearly Growth Per Cent	Yearly Growth Cubic Ft.
7	64.8	4.7	3.05
8	233.1	3.9	9.09
9	454.4	3.3	14.995
10	389.4	2.8	10.90
11	550.0	2.4	13.20
12	261.0	2.1	5.48
13	204.0	1.9	3.88
Totals	2,156.7		60.595

From this table it is evident that a yearly growth of 60 cubic feet may be expected or, in terms of cords, at 90 cubic feet, a yearly growth of 2-3 cords per acre. At that rate, it will not take long to produce a second cut of merchantable timber. Meanwhile, reproduction of the pine is assured, unless destroyed by fire—the one great menace to continue forest production in this region!

Turning to an older area—here are the figures for a 45 year old stand of "Shortleaf" pine within Mr. Cherry's fenced and protected (from fire) preserve:

TABLE 3

One Acre Plot in Forty-five Year Old "Shortleaf" Pine

Diameter Breast High Inches	Total Height Feet	No. Trees Per Acre	Vol. Bd. Ft. (Doyle Rule)
7	64	6	150
8	68	9	405
9	72	8	480
10	76	16	1,535
11	80	11	1,320
12	84	12	1,800
13	87	4	860
14	90	9	2,340
15	93	5	1,525
16	96	14	5,600
17	98	2	920
18	101	3	1,560
19	103	4	2,320
20	105	2	1,290
21	107	6	2,720
22	109		
23	111	1	969
24	112	2	2,090
25	113		
26	114	1	1,215
Totals	115		31,110

This stand permits of comparison with recorded measurements of second growth "Shortleaf" Pine in other localities. In the April number of the Journal of Forestry, R. C. Forbes, until recently Director of the Southern Forest Experiment Station, gives the following yields for "Loblolly" (*i. e.* "Shortleaf") Pine in the South.

TABLE 4

Age (Years)	Volume in Board Feet Per Acre		
	Best Sites	Medium Sites	Poor Sites
40	43,000	29,900	16,000
60	63,000	44,900	26,500

In this scale the values in Table 3 correspond almost exactly to those for medium sites—at 45 years. Table 4 would give 31,150; the volume per acre by Table 3 is 31,110 board feet. It should be noted, however, that the values in Table 4 are for fully stocked stands. If the plot recorded in Table 3 were fully restocked—*i. e.*, not depleted by frequent fires—there can be no doubt but that it would measure up to the values given in Table 4 for the best sites. (Such a comparison is now being made with the yield tables of the Southern Forestry Experiment Station, but is too technical to be gone into here.)

Finally, it may be of interest to record the growth of "Shortleaf" Pine in diameter as studied on 80 typical stumps of recently cut trees. The age is given at varying breast heights (4¼ feet above the ground) diameters, outside bark:

TABLE 5

Diameter Breast High Inches	Age Years	Diameter Breast High Inches	Age Years
4	7	17	29
5	8.2	18	31.8
6	9.4	19	34.8
7	10.7	20	38
8	12	21	41.5
9	13.4	22	45.4
10	14.9	23	49.6
11	16.5	24	54.2
12	18.2	25	59.2
13	20	26	64.7
14	22	27	70.7
15	24.2	28	77.3
16	26.5	30	92.3

It is hoped in subsequent years, to amplify these studies of the growth—that its phenomenal is beyond question and constitutes the strongest argument for continuous forest production in the Southern Coastal Plain."

SOME VALUABLE TREES TO GROW IN SOUTH CAROLINA

Longleaf Pine (Pinus palustris)

Longleaf pine resists fire to a remarkable degree, yields turpentine in rather large quantities and is better able to thrive in deep, dry, sandy soils than any other pine. During the first three to five years it makes chiefly root growth, but afterwards grows fairly rapid in height.

The wood is heavy, hard, strong, tough and durable. It has been, and still is, used for all kinds of building and other construction. Naval stores, consisting of tar, pitch, rosin and turpentine, are obtained almost exclusively from this tree and its close relative, the slash pine, by bleeding the trees for their raw gum.

Longleaf pine is suggested for planting on high, dry ridges and very deep sandy soils, and also because of its high fire resistance. The seeds are small (about eight thousand to the pound) and may be sown in nursery beds, but seedlings should be transplanted to their final locations not later than after the first growing season when they are eight to twelve months old. When left in the nursery beds longer than one season transplanting is difficult on account of the long tap root characteristic to the longleaf pine. Pruning the tap root to six or eight inches makes planting easier and aids in developing a bushy root system.

Slash Pine (Pinus caribaea)

Slash pine is the most rapid grower of any of the pines and produces naval store products in very large quantities. It is moderately susceptible to injury by fire when young. It is easily propagated by seed and not difficult to transplant. Slash pine is particularly adapted to flat, wet or savanna lands, but thrives best in rich, sandy soil.

The wood is heavy, hard, strong, tough, durable and very resinous. It is sawed into lumber and sold without discrimination as longleaf pine, being used for general building and heavy construction purposes, for which it brings good prices.

Slash pine is suggested for planting in moist soils and locations in the coastal plain region. It may thrive in the lower and middle Piedmont, but should not be planted except experi-

mentally on the latter sites. The seeds are very small and average about eighteen thousand to the pound. Slash pine within its natural range is regarded as one of the most profitable trees in the South.

Loblolly Pine (Pinus taeda)

Loblolly pine (Shortleaf or old-field) thrives over a large area including the coastal section of the State. It grows rapidly, is propagated from seed and has replaced cut-over longleaf pine lands very extensively where fires have been kept out. In some sections a tip moth temporarily keeps back the early growth. There are about twenty thousand seeds of this species to the pound.

The wood is resinous and coarse-grained, with marked contrast, as in the other yellow pines, between the bands of early and late wood. The wood of second-growth trees has a wide range of uses where durability is not a requisite, such as building material, box shooks, barrel staves, basket veneers, pulpwood, lath, mine props, piling and fuel.

Shortleaf Pine (Pinus echinata)

Shortleaf pine finds its home in the Piedmont section. It thrives well in dry, clayey and gravelly soils and is a good tree for washed and gullied lands. Its growth is moderately rapid, and because of its narrow crown permits more trees per acre than its common associate over the lower Piedmont—the loblolly pine. Its total yield per acre after the first thirty years is well up to that of the loblolly pine on similar grades of land.

The wood of old trees is rather heavy and hard, of yellow-brown or orange color, fine-grained and less resinous than that of the other important Southern pines. It is used largely for interior and exterior finishing, general construction, veneers, paper pulp, excelsior cooperage, mine props and other purposes.

The tip moth works upon it in some sections, but it has no other serious enemies. It is suggested for planting in the Piedmont region and on the lower mountain slopes. The seed are very small, averaging fifty thousand to the pound.

White Ash (Fraxunus americana L)

The white ash is found throughout the State, but grows to the best advantage in the rich moist soils of the river bottom-

lands and valleys. It reaches a height of 50 to 80 feet and a diameter of 2 to 4 feet, and occasionally larger. The bark varies in color from light gray to a gray brown. The rather narrow ridges are separated with marked regularity by deep diamond-shaped fissures.

The wood of the white ash is extremely valuable on account of its toughness and elasticity and is preferred to all other native woods for tool handles, athletic supplies such as rackets, baseball bats and oars, and agricultural implements. Much furniture and interior finish is made of ash. It is one of our best hardwood species and is recommended for planting where there is soil adapted to good growth.

Yellow Poplar or Tulip Tree (Liorodendron tulipifera L)

Yellow poplar or tulip tree is one of the largest and most valuable hardwood trees of the United States. It occurs commonly throughout the State, but reaches its largest size in deep, moist soils along streams and in the lower mountain coves. Growing with a straight central trunk like the pines and often clear of limbs from 30 to 50 feet, it attains a height of 60 to 100 feet and a diameter of 3 to 4 feet. Original growth trees are known to be 175 feet high and nearly 10 feet in diameter.

The wood is light, soft and easily worked. It is widely used for interior and exterior finish and for vehicle bodies, veneers, turnery and other high grade uses. It is recommended for planting on moist alluvial soil along streams and lowlands.

Black Walnut (Juglans nigra L)

The black walnut is one of the most valuable trees when grown in the forest. When grown in the field or open spaces in the forest it produces nuts in large quantities, but, as a rule, open grown trees are short and knotty and not so desirable for work where strength is required. In the forest it frequently attains a height of 100 feet with a straight stem and few branches.

The nuts occur singly or in pairs and are enclosed in a solid green husk which does not split open even after the nut is ripe. The nut itself is black with a very hard thick finely ridged shell enclosing a rich, oily kernel which is edible and highly nutricious.

The heartwood is of superior quality and value. It is heavy, hard and strong and chocolate-brown in color. Its durability, high polish characteristic and freedom from warping and checking makes it highly prized for a great variety of uses, including furniture and cabinet work, gun stocks, aeroplane propellers and inside house finish.

Walnut is easily propagated from the nuts and is recommended for planting on rich bottom lands and moist fertile hillsides throughout the State. Planting the nuts where the trees are to stand has proved very successful, but the trees may be grown in nursery beds and set out after the first year's growth.

White Oak (Quercus alba L)

The white oak is perhaps the most valuable of all the oaks and is found in a wide variety of soils. When grown in a dense stand it has a straight continuous trunk free of side branches, but when grown in the open many limbs are produced. It commonly reaches a height of 60 to 100 feet and a diameter of 2 to 3 feet. Much larger trees are found on the best soils.

The wood is heavy, strong, hard, tough and durable. It has a wide variety of uses such as furniture, wagons, implements, interior finish, flooring, ship building, cooperage, car construction, ties and other high grade products. White oak is recommended for forest, highway and ornamental planting, particularly on the heavier, clayey soils.

Black Locust—Yellow Locust (Robinia pseudacacia L)

The black locust occurs throughout the entire State, and in all soils and conditions of moisture except swamps. It is found as a forest tree only in the mountains where it attains a height of 80 to 100 feet and a diameter of 30 inches. Throughout the other sections of the State it occurs generally in thickets, on clay banks or waste places, or singly along fence rows. The twigs and branchlets are armed with straight or slightly curved sharp spines, sometimes as much as one inch in length which remain attached to the outer bark for many years.

The fruit is a pod from 3 to 5 inches long containing 4 to 8 small, hard seeds which ripen late in the fall. The pods split open during the winter, discharging the seeds. Some seeds usually remain attached to each half of the pod and this acts

as a wing upon which the seeds are born to considerable distance before the strong, spring winds.

The wood is yellow in color, coarse-grained, very heavy, very hard, strong and very durable in contact with the soil. It is used for fence posts, tree nails, insulator pins and occasionally for lumber and fuel.

Red Cedar (Juniperus virginiana L)

Red cedar is a very valuable tree found in all classes and conditions of soils from swamps to dry rocky ridges. It very often thrives on barren soils where few other trees are found. It is scattered throughout the State, except in the mountains, but it is most important in the middle section. The tree is very irregular in its growth, so that the trunk is more or less grooved.

The heartwood is distinctly red, and the sapwood white, this color combination making a very striking effect when finished. The wood is aromatic, soft, strong and of even texture and is extensively used for cedar chests, closets and interior woodwork and lead pencils. It is very durable in contact with the soil and on this account is in great demand for posts, poles and rustic work. Even though red cedar is a slow growing tree in comparison to many other trees, it should be grown wherever possible, because the wood is always in demand and brings fairly high prices.

Scaly-Bark or Shell-Bark Hickory (Hicoria ovata Britton) (Carya ovata K. Koch)

The scaly-bark hickory is known by every child of the community because of its sweet and delicious nuts. It is a large commercial tree averaging 60 to 100 feet in height and 1 to 2 feet in diameter. It thrives best on rich, damp soil and is common along streams and on moist hillsides throughout the State. The bark of the trunk is rougher than on other hickories, light gray and separating into thick plates which are only slightly attached to the tree.

The wood is heavy, hard, tough and very strong and is used largely in the manufacture of agricultural implements, tool handles and in the building of carriages and wagons. It is one of the best woods for fuel and its growth should be encouraged where possible.

Whiteheart or White Hickory (Hicoria alba Britton)

The white hickory, whiteheart, mockernut, or big-bud hickory, as it is called, is found on well-drained soils throughout the State. It grows tall, with short limbs averaging 60 feet in height and one to two feet in diameter. The bark is dark gray, hard, closely and deeply furrowed, often apparently cross-furrowed or netted. The wood is hard, tough, heavy and strong. It is white excepting the comparatively small, dark brown heart. For this reason it is called white hickory. It is used for vehicle parts, handles, etc. It furnishes the best of fuel and is very desirable both for forest and shade trees.

Holly (Llex apaca Ait)

The holly appears sparingly scattered throughout the State. It prefers a rich, moist soil, but is also found on the higher and drier lands. It is much less abundant now than formerly, due to the large amount gathered and shipped to large cities for Christmas decorations. It is a small evergreen tree, seldom exceeding 30 feet in height and 12 inches in diameter. The bark is light gray and roughened by a wart-like growth. The numerous short, slender branches form a dense, narrow pyramidal head of a striking dark green color effect, especially when well laden with the conspicuous red berries.

The wood is light, tough, not strong and nearly white. It is valued and much used for cabinet work and wood-turning. For this reason many of the larger, finer trees have been cut and marketed. This valuable tree should be grown in large quantities.

Dogwood (Cornus florida L)

The dogwood, sometimes referred to as the flowering dogwood, is found growing throughout the State, usually under the larger forest trees. It is a small tree from 15 to 30 feet high and 60 to 12 inches in diameter, with a rather flat, spreading crown and short, often crooked trunk.

The wood is hard, heavy, strong and very closely grained, brown to red in color. It is in great demand for cotton mill machinery, turnery handles and forms. The dogwood, with its masses of early spring flowers, its dark-red autumn foliage and its bright red berries, is probably our most ornamental native

tree. It should be used much more extensively in roadside and ornamental planting.

FIRES AND FOREST GROWTH

By E. L. Demmon, Director Southern Forest Experiment Station

It is assumed that most of us recognize the importance of timber growing to the South. The fact that fully two-thirds of its total land area is at the present time more valuable for the production of timber and forest products than for any other purpose only serves to emphasize this statement. The bulk of the South is comprised of cut-over forest lands. It is generally conceded that no great proportion of these will be needed for agriculture for many years to come. Unless these lands are managed for the production of timber crops, their idleness must reflect unfavorably on the economic future of the region.

Commercial forestry practice in the South cannot succeed without adequate fire protection. Largely because of fire, there are today millions of acres of forest land in this region producing but a fraction of their potential growth of wood.

There is adequate evidence that if fires could be eradicated new crops of trees would soon appear where reasonable measures of forest management are adopted.

Great strides have already been made in controlling forest fires. There are many evidences throughout the South that lands can be successfully protected and at a reasonable cost. It is a regrettable fact therefore that the annual toll taken by fires in this region is so high. Statistics compiled by the United States Forest Service show that in 1927 eighty per cent of all the fires, ninety-five per cent of the total area burned over, and eighty-nine per cent of the forest fire damage in the United States occurred in the Southern region. These figures have been submitted by State forestry officials in those states with organized forestry departments, certainly the most competent source for such information. That such losses are largely preventable is shown by the fact that the greatest proportion of forest fires are the result of human agencies. It is only through organized preventive measures, however, that fire control can be successful.

Fires in the South are not of the spectacular nature encountered in the Western United States where they often get in the

tree crowns, causing complete destruction to forest growth over large areas. On the contrary the ordinary fire in the Southern region is commonly known as a ground or grass fire, usually occurring during the winter season. The general opinion seems to be that these fires do little or no damage to the forest. Such an erroneous idea fits in well with the common practice of winter burning which has been nearly everywhere prevalent in the South since settlement took place about 100 years ago. It is true that such fires rarely kill large trees outright, but they do take an immense toll from the forest tree seedlings.

The seriousness of the problem is recognized by foresters and others who have made a careful study of the fire situation. In order to obtain definite information on fire damage, the Southern Forest Experiment Station has carried on a number of fire studies ever since the station was established in 1921. The information thus gathered should be of considerable value to forest land-owners and public agencies engaged in combating fires.

In the conduct of fire studies, the station has established a number of plots in second-growth pine stands throughout the South. These plots are burned at regular intervals and careful observations are taken periodically of the mortality and growth of the surviving trees. Other more extensive studies have been made of the effect of single or repeated fires. The results of some of these findings will be presented here.

Fires cause damage in a number of ways. The most apparent effects are the destruction of merchantable timber and improvements, such as fences and buildings. Other aspects of fire damage, although not so apparent, may be even more important. Tree growth is retarded, small trees are killed outright, larger trees become susceptible to attacks by insects and disease, game and wild life are destroyed, the recreation value of forests is lessened, soil fertility is impaired, and erosion and washing away of valuable top soil follows with its consequent damage to watersheds. The total damage caused by fires is an extremely intangible quantity and dependent on so many contributing factors that precise dollar and cents loss figures can never be arrived at exactly. There are many advantages, however, in having a basis for figuring damage. Such a basis should result from the Southern Station fire studies.

Winter fires, coming at a time when the tree is dormant, have less killing effect than fires which occur during the active grow-

Twelve years old above the ground

Three years old above the ground

What a difference a few fires make. At the left are shown longleaf pines twelve years old above the ground growing on land burned over annually. The young trees are only two and one-half feet high. At the right is an example of longleaf pine growing under protection from fire. Although only three years old above the ground, the young tree reaches a height of eight feet

The effect of fire in the woodlot. Above is shown an area protected from fire, on which at forty years of age the forest growth has a volume of 1,793 cubic feet an acre. The woodlot shown below has been burned over annually and its wood yield is only 664 cubic feet an acre at forty years of age.

ing season in the spring and summer. Small seedlings and trees are more susceptible to fire damage than larger trees. Damage is more severe during periods of drought. On areas protected from fire for a number of years there is some increase in the fire hazard but this is more than offset by the advantages from complete protection. Dense undergrowth or slash left on logging areas markedly increases the fire danger. Dense thickets are more seriously injured by fire than are trees growing in the open. Some species of trees are much more resistant to fire injury than are others.

The effect of fire on forest tree seedlings will be considered first. The oldest station plots for the study of the effects of fire are located at Urania, Louisiana. Two plots of fifteen months' old longleaf pine seedlings were fenced in 1915; one plot has been burned over each winter, the other protected. Observations have been made at intervals on the survival and growth of these pines. This experiment illustrates the wonderful fire resistant qualities of the longleaf pine, as even on the burned plot most of the seedlings have survived the annual winter fires. The effect on growth, however, has been very marked. At the age of ten years the average sapling on the burned plot was less than one-half as tall as on the protected side. The difference in volume growth is much greater, the burned trees showing considerably less than half of the volume produced under complete protection. A graphic presentation of the results from this experiment has been widely used in educational posters in various parts of the South.

In northern Louisiana a summer fire which burned through a cutover longleaf pine area caused the death of one-third of all the trees over eight inches in diameter. These trees represented the remnants of the virgin stand that had been left when the original stand was harvested about twenty years before. Previous to a summer fire which occurred in a longleaf pine cut-over area in northern Louisiana the tract was replanted with over 100 longleaf and loblolly pine seedlings to the acre, ranging up to fifteen feet in height. As a result of this single fire, seventy-two per cent of the longleaf and all of the loblolly seedlings were killed. Assuming that the cost of planting longleaf pine seedlings amounts to from four dollars to five dollars an acre, this single fire resulted in a direct loss of at least three dollars an acre and several years' tree growth aside from its

effect on the development of the trees which survived the fire. A fire coming in the winter time would undoubtedly have caused less damage. It may be of interest to record that the highest percentage of mortality among the longleaf seedlings occurred in those between six inches and four feet in height. This range in height above ground corresponds with the height of the flames, indicating that the longleaf pine seedling is most easily injured by fire when the tree is between five and seven years of age, although before and after that stage its resistance to fire is remarkable. Studies of fire damage to slash pine seedlings have been made in south Georgia and south Mississippi. A spring fire in south Georgia killed eighty-five per cent of the slash pine seedlings seven years old. These seedlings ranged up to sixteen feet in height. A summer fire in the same locality wiped out seventy-four per cent of a stand of five year old seedlings. Where underbrush was dense the mortality reached eighty-eight per cent; where brush was scant, but sixty-four per cent of the trees were killed. In both of these instances, however, all seedlings under three years old and under four feet in height were destroyed.

On two separate areas of young slash pine in south Mississippi, summer fires caused severe damage to reproduction. Seventy-nine per cent of a five year old stand was wiped out and sixty-five per cent of a six year old stand was destroyed. In each of the instances just cited no fires had occurred from the time the seedlings had become established. Fires coming earlier in the development of these stands would undoubtedly have destroyed a larger proportion of the trees because of the greater susceptibility to fire damage when less fully developed. Each additional year of complete fire protection assures better chances of resistance to any accidental fires that may occur.

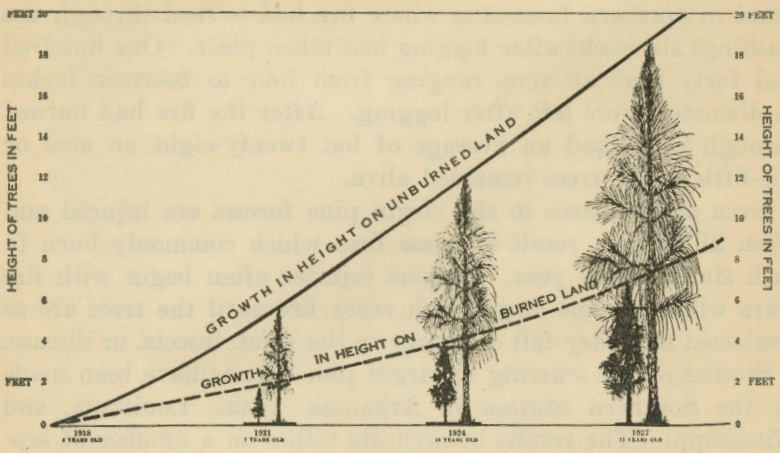
A winter fire in southeastern Louisiana killed seventy-seven per cent and eighty-five per cent respectively, of two stands of loblolly pine seedlings. These seedlings ranged up to eight years old and in height from one to twelve feet. All of the one and two year old seedlings or all those under two feet in height were entirely wiped out. There still remained 570 and 870 living seedlings per acre respectively as a nucleus for a new stand.

In eastern North Carolina a winter fire swept through an eight year old loblolly pine thicket that had been subjected to periodical fires in the past. As the result of this last fire, ninety per

The effect of fire on the height growth of longleaf pine seedlings. The plot shown above has been protected from fire since 1915, while the area below has been burned annually over the same period.

cent of all the trees were killed and none under four feet high survived.

Shortleaf pine differs from the other Southern pines in its ability to sprout following fire. Even with this advantage it cannot withstand annual burning. On an area in southeastern Oklahoma that had been cut over four years previously a stand of over 9,000 shortleaf seedlings an acre had become established where no fires had occurred following the cutting. On an adjacent area which had been swept by fires each year since the cutting, 130 seedlings an acre were found to have survived and these were badly stunted.



Comparative height growth of young longleaf pine on burned and unburned land

In eastern Texas fifty-nine per cent of a stand of four year old shortleaf pine seedlings survived a fire. Most of these came through only because of their ability to sprout up from the roots after the tops had been killed back.

In a ten year old stand of loblolly pine near Urania, Louisiana, but four per cent of the trees survived a summer fire that came during a period of drought. Fires during other seasons of the year on similar tracts nearby have killed few trees, which points to the extreme hazard existing in very dry periods during the growing season.

In the spring of 1927, fires in southern Georgia, which occurred following a two months' dry period, were very destructive to both old as well as young timber. In ponds that had

entirely dried out, practically every slash pine and cypress tree was killed. On the higher ground nearby longleaf pine also suffered severe damage, particularly those trees which had been turpentined. On longleaf areas that had not burned for two years previous, fifty-six per cent of the turpentined trees were killed, whereas but thirty-two per cent of the unturpentined succumbed. Fires readily ignite old turpentine faces and the heat thus generated is often sufficient to cause the death of the tree. This holds true for most turpentine areas where fire normally gets in after the turpentining operations have been completed.

A study of fire damage was made on a shortleaf and loblolly stand in northern Louisiana where fire had burned through the slashings six weeks after logging had taken place. One hundred and forty trees an acre, ranging from four to fourteen inches in diameter, were left after logging. After the fire had burned through this stand an average of but twenty-eight an acre or one-fifth of the trees remained alive.

Even mature trees in the virgin pine forests are injured and often killed as a result of grass fires which commonly burn in such stands every year. Serious injuries often begin with fire scars which become larger with every fire until the trees are so weakened that they fall easy prey to the wind, insects, or disease.

Studies of fire-scarring in virgin pine forests have been made by the Southern Station in Arkansas, Texas, Louisiana, and Mississippi. The results of accurate tallies on a number of separate areas showed that on the average one out of every four longleaf and one out of every nine shortleaf pine trees in the virgin forests bear visible fire scars. The connection between woods fires and this damage to virgin timber is rarely recognized by lumbermen, although fire scars have a decided effect on the quality and quantity of lumber sawed from such logs. Fire-scarred butt cuts are often bucked off and left in the woods; this is especially true of hardwoods. The fact that the portion of the tree affected by fire scars normally produces the finest grades of clear lumber materially adds to losses when this section of the tree is injured.

In connection with a mill scale study in virgin shortleaf pine in Arkansas, the Forest Products Laboratory found that fire damaged logs yielded only eighty-five per cent as much lumber as sound logs and were worth $10.20 less per thousand board feet gross log scale.

There are numerous evidences that fire has a deterimental effect on the growth of forest trees. Its effect on height growth of longleaf pine has already been commented upon.

Another example of the effect of repeated fires on tree growth is afforded by a farmer's loblolly pine woodlot in southeastern North Carolina. In order to protect his woodlot from fires sweeping in from the outside this farmer has made a fire line entirely around the woodlot. This fire line covers a strip of ground nearly 100 feet wide from which the grass has been burned off every year during the winter months for the last twenty years at least. There is a scattering stand of loblolly pine on the fire line of the same age as the protected stand. The fire line, however, is entirely devoid of seedlings, saplings, and brush which form a dense thicket over the entire protected woodlot. A comparison was made between the growth and stand of trees on the fire line with that inside the woodlot. The dominant trees average forty years old on both areas but those trees subjected to annual fires average nine feet shorter in height than those on the protected area. The trees on both areas range from four to sixteen inches in diameter but there are 158 an acre on the protected woodlot compared to sixty-two an acre on the fire line. Likewise, the total volume on the protected side averages 1,793 cubic feet an acre compared with 664 cubic feet an acre on the fire line, or nearly three times as much wood produced where fires have been kept out.

Three hundred and twenty acres of typical cut-over longleaf pine land in southern Mississippi was fenced in 1923. One-half of this area has been burned over every year since that time, the fires being set during the winter months, corresponding to conditions ordinarily found in the adjacent country. With the exception of two reserved check plots of ten acres each, the remaining 300 acres has been grazed by cattle at the rate of one steer to ten acres, between March and November each year.

Sample plots were staked out throughout this 320-acre area and periodic examinations have been made to determine the effects of fire and grazing on the longleaf pine seedlings which became established from the heavy seed crop of 1924.

The data obtained from these examinations has not been completely analyzed. Preliminary conclusions, however, showed that eighty-five per cent of the pine seedlings survived when given complete protection from fire and grazing, whereas but seventy-

five per cent came through on areas that were grazed but not burned. The loss on the burned areas was much greater. With grazing fifty-six per cent of the seedlings survived; without grazing only eighteen per cent came through. This indicates that grazing has done little harm where fires have been eliminated and has greatly increased the chances of seedling establishment where fires have occurred annually. One clear-cut conclusion to be drawn from this experiment is the serious damage which annual fires cause in the natural reproduction of longleaf pine.

The use of fire as a protective measure in turpentine orchards is common practice throughout this region. As an insurance against accidental fires, areas to be worked for turpentine are normally burned over every winter just before turpentine operations begin. There is little doubt but that these fires influence the yield of gum obtained.

Dr. Eloise Gerry and Dr. Austin Cary in cooperation with the Southern Railway Company in South Carolina carried on such a test on a small scale, in 1927, using trees averaging nine inches in diameter. The yields of gum were obtained from two comparable groups, one of which was burned and the other not. The yield calculated in barrels of spirits per crop—10,000 faces—indicated that the burned trees produced at the rate of about eighteen barrels per season as compared with a yield of twenty-nine and one-half barrels from the trees protected from fire. This represented a monetary loss of $287.50 per crop, with turpentine averaging $25.00 a barrel; this does not include the loss in resin which is even greater than the loss on the turpentine.

These illustrations point toward the damage suffered each year from the widespread occurrence of fire in the South. The growth of trees and yield of forest products are also seriously affected to the point where forest management is impracticable without fire protection. When the people realize that fires lower the values of taxable property thereby increasing the tax burden elsewhere, it is to be hoped that adequate steps will be taken to hasten the day towards more complete protection. Rapid advance has already been made through State forestry departments, the United States Forest Service and forward-looking timberland owners in giving fire protection to limited areas, but in 1927 these comprise only thirty per cent of the area needing protection. Without complete protection from fire, mil-

lions of acres of forest land in the South can never attain the full productive capacity necessary to the best economic development of the region.

COOPERATIVE FOREST FIRE PROTECTION AGREEMENT BETWEEN THE SOUTH CAROLINA STATE COMMISSION OF FORESTRY

and

The .....

of .....

WHEREAS, THE SOUTH CAROLINA STATE COMMISSION OF FORESTRY is authorized and empowered by law to give advice, assistance and cooperation to private owners of forest land and to cooperate with the Federal Government in the distribution of funds allotted to the State for forestry purposes; and

WHEREAS, the Clarke-McNary Federal Forestry Law provides among other things, that the Secretary of Agriculture, through the U. S. Forest Service, may cooperate with the several states in the prevention and control of forest fires on State and private lands; and

WHEREAS, the Secretary U. S. Department of Agriculture has issued the following instructions governing Federal Government cooperation in forest fire control:

"It will, therefore, be the policy of the Federal Government to allow private expenditures to be accredited with State expenditures as an offset to the amount expended by the Federal Government where such expenditures are either (1) required by State law or (2) incurred in cooperation with, or supplemental to, the State's protective system and under State supervision. In every case, the protection must have reasonable assurance of permanency. Unless the work is done directly by the State or Federal Forest Service, it should be based upon a written agreement between the State and the private agency, which provides for the protection of all classes of forest lands within the area covered by the agreement, and the State must vouch for the correctness of the expenditures."

THEREFORE, it is agreed,

That, effective ....., 19....,

the said .....

(name of private agency)

will provide the forest fire protection system described below, to be organized and administered in cooperation with and under the supervision of the State Commission of Forestry, to cover all classes of forest lands within the area or areas included in this agreement, whether such lands are in whole or in part virgin, culled or cut-over, in.....Count.....; as shown on the attached map which is part of this agreement.

LANDS TO BE PROTECTED:

Location .....

Acres virgin or old growth .....; Acres culled....;

Acres cut-over .....; Acres of second growth or young growth .....

Acres falling in any other classification .....

Total number acres covered by this agreement.....

PROTECTIVE ORGANIZATION:

Cost per year of administration $.....

Character of administration .....

Number wardens, guards and patrolmen .....

Number lookout men .....

Cost per year for wardens, guards, patrolmen and lookouts $.....

Duties of wardens, guards, patrolmen and lookouts .....

.....

IMPROVEMENTS: Including construction and maintenance:

Miles of telephone line .....; Cost $.....

Miles of fire line .....; Cost $.....

Number fire towers .....; Cost $.....

Cost fire tools, pumps and equipment $.....

Cost of all other improvements $.....

Total cost per acre per year $.....

Total cost per year $.....

2. That, the said .....
(name cooperating agency)

authorizes the appointment by the State Commission of Forestry of certain of its (his or their) forest protective employees as Forest Wardens or Deputy Forest Wardens.

3. That, the said .....
(name cooperating agency)

shall keep a record of expenditures incurred in connection with the protective system herein agreed upon, showing for each expenditure the voucher, date of payment, name and address of payee, purpose or object to which applied, and the amount.

4. That, the State Forester or his duly designated assistants may exercise direct supervision of the protective measures herein agreed upon; that the State Forester and his duly designated assistants may at any time inspect the area under protection, and that the State Forester and the Federal Inspection Officer under the Clarke-McNary Law may have access at all reasonable hours to the books and voucher files to check expenditures under this agreement; and

5. That, the State Commission of Forestry will upon receipt by the State Forester of proper vouchers submitted monthly or quarterly as requested by the State Forester covering expenditures made by .....
(name cooperating agency)

in accordance with this agreement, refund an amount not to exceed twenty-five per cent (25%) of said expenditures to the said .....
(name cooperating agency)

IN WITNESS WHEREOF, the parties hereto have caused this AGREEMENT to be executed, this ..... day of..... ..... 19.....

SOUTH CAROLINA STATE COMMISSION OF FORESTRY

By ..... Title.....

.....

(name cooperating agency)

By ..... Title.....

SOUTH CAROLINA STATE COMMISSION OF FORESTRY

Cooperative Forest Fire Prevention Report

For Period ..... To.....

FIRE PREVENTION:

A. Administration (centralized overhead)

..... $.....

..... $.....

..... $..... $.....

B. Field Personnel (salaries and wages)

..... $.....

..... $.....

..... $..... $.....

C. Improvements, tools and other equipment

..... $.....

..... $.....

..... $..... $.....

D. All other expenditures

..... $.....

..... $.....

..... $..... $.....

FIRE EXTINCTION ..... $..... $.....

Grand Total $.....

I hereby certify that the above expenditures have been made in accordance with cooperative agreement with the South Carolina State Commission of Forestry for Prevention and Extinction of Forest Fires.

Cooperator .....

By .....

Title .....

Date of Report

.....

AN ACT (1929)

AUTHORIZING THE STATE COMMISSION OF FORESTRY TO GROW, DISTRIBUTE AND REGULATE THE SALE OF FOREST TREE SEEDLINGS AND TRANSPLANTS FOR REFORESTATION PURPOSES AND TO AUTHORIZE THE SINKING FUND COMMISSION TO TRANSFER TO THE STATE COMMISSION OF FORESTRY CERTAIN WASTE LANDS.

SECTION 1. *Be it enacted* by the General Assembly of the State of South Carolina: That the State Commission of Forestry is hereby authorized to grow forest tree seedlings and transplants, and to sell the same, at a sum not to exceed the average cost of production and distribution, to landowners desiring to plant them for reforestation purposes.

SECTION 2. No trees shall be sold by the State Commission of Forestry under the provisions of this Act that are to be planted for table trees, potted trees or for shade trees or ornamental use. *Provided*, That nothing in this Act be construed to pro-

hibit the State Commission of Forestry from growing seedlings or transplants for distribution to be planted on State or Federal lands, public school grounds and other public institutions or along state highways.

SECTION 3. All receipts from the sale of forest tree seedlings or transplants under the provisions of this Act shall be paid into the State Treasury and shall become a revolving fund for use by the State Commission of Forestry in the operation of forest tree nurseries.

SECTION 4. The Sinking Fund Commission is hereby authorized and directed to convey to the State Commission of Forestry certain waste lands now owned by the same or hereafter owned by the State, as in the judgment of the Sinking Fund Commission may be to the interest of the State for forestry development, reforestation, or other uses of the State Commission of Forestry.

SECTION 5. Upon the sale of trees, timber or other articles or things upon such lands conveyed to the State Commission of Forestry by the Sinking Fund Commission, or upon the sale of such lands so conveyed, the State Commission of Forestry shall pay to the Sinking Fund Commission a sum or sums equal to the amount chargeable against said lands at the time of such conveyance.

SECTION 6. That all Acts or parts of Acts inconsistent with this Act are hereby repealed.

SECTION 7. This Act shall take effect immediately upon its approval by the Governor.

Approved the 16th day of March, 1929.

AN ACT (1929)

AUTHORIZING THE STATE COMMISSION OF FORESTRY TO OWN REAL ESTATE, TO RECEIVE GIFTS, DONATIONS OR CONTRIBUTIONS FOR PURPOSES WITHIN THE POWERS AND DUTIES OF THE COMMISSION.

SECTION 1. *Be it enacted* by the General Assembly of the State of South Carolina: That the State Commission of Forestry is hereby authorized to accept and hold gifts, donations, or contributions from individuals, associations, corporations,

counties, municipalities or other agencies, and to acquire real estate for purposes within the powers and duties of the Commission.

SECTION 2. Any gift, donation or contribution accepted and held by the State Commission of Forestry under the provisions of this Act shall be used for the purpose, or purposes, specified by the donor.

SECTION 3. All Acts or parts of Acts inconsistent with this Act are hereby repealed.

SECTION 4. This Act shall take effect immediately upon its approval by the Governor.

Approved the 16th day of March, 1929.

Help increase the wealth of South Carolina by preventing and extinguishing Forest Fires.

GROW TREES!